

## Thinking Through a Lesson

The main purpose of the Thinking Through a Lesson assignment is to provide you with first-hand experience in thinking deeply about a specific lesson related to proportionality. The goal here is to move beyond the structural components associated with lesson planning (e.g., listing the materials you will need, describing the way students will be grouped, determining teacher actions during the lesson) to a deeper consideration of how you are going to advance students' mathematical understanding during the lesson. This is not to say that structural components of a lesson are not important, but rather that a focus on structural components alone is *not sufficient* to ensure that students learn mathematics.

### Part One – Solving the Task as a Learner and as a Teacher

During the course, you and a partner will be assigned a task or activity related to proportionality. You will begin by working with your partner to solve the task as many ways as you can and to anticipate the ways in which you think students will solve the task. This may include considering approaches that are incorrect as well as correct, inefficient as well as efficient, and unsophisticated as well as sophisticated.

After you have solved the task, you will identify the mathematical ideas related to proportionality that can be learned from the task and your specific goals regarding what you hope your students would learn from engaging in this task. [Class time will be allocated for this purpose.]

### Part Two – Thinking about How to Promote Student Engagement and Learning

You will continue to work on the lesson individually, drawing on the work completed in part one. The focus of your independent work will be on thinking through what you as a teacher will do to support your students' engagement with and learning from this task. The following questions should be used to guide your thinking:

#### Selecting and Setting up a Mathematical Task

- What are your mathematical goals for the lesson (i.e., what is it that you want students to know and understand about mathematics as a result of this lesson)?
- In what ways does the task build on students' previous knowledge? What definitions, concepts, or ideas do students need to know in order to begin to work on the task? What questions will you ask to help students access their prior knowledge?
- What are all the ways the task can be solved?
  - Which of these methods do you think your students will use?
  - What misconceptions might students have?
  - What errors might students make?
- What are your expectations for students as they work on and complete this task?
  - What resources or tools will students have to use in their work?
  - How will the students work -- independently, in small groups, or in pairs -- to explore this task? How long will they work individually or in small groups/pairs? Will students be partnered in a specific way? If so in what way?
  - How will students record and report their work?
- How will you introduce students to the activity so as not to reduce the demands of the task? What will you hear that lets you know students understand the task?

## **Supporting Students' Exploration of the Task**

- As students are working independently or in small groups:
  - What questions will you ask to focus their thinking?
  - What will you see or hear that lets you know how students are thinking about the mathematical ideas?
  - What questions will you ask to assess students' understanding of key mathematical ideas, problem solving strategies, or the representations?
  - What questions will you ask to advance students' understanding of the mathematical ideas?
  - What questions will you ask to encourage students to share their thinking with others or to assess their understanding of their peer's ideas?
- How will you ensure that students remain engaged in the task?
  - What will you do if a student does not know how to begin to solve the task?
  - What will you do if a student finishes the task almost immediately and becomes bored or disruptive?
  - What will you do if students focus on non-mathematical aspects of the activity (e.g., spend most of their time making a beautiful poster of their work)?

## **Sharing and Discussing the Task**

- How will you orchestrate the class discussion so that you accomplish your mathematical goals? Specifically:
  - Which solution paths do you want to have shared during the class discussion? In what order will the solutions be presented? Why?
  - In what ways will the order in which solutions are presented help develop students' understanding of the mathematical ideas that are the focus of your lesson?
  - What specific questions will you ask so that students will:
    - make sense of the mathematical ideas that you want them to learn?
    - expand on, debate, and question the solutions being shared?
    - make connections between the different strategies that are presented?
    - look for patterns?
    - begin to form generalizations?
- What will you see or hear that lets you know that students in the class understand the mathematical ideas that you intended for them to learn?
- What will you do tomorrow that will build on this lesson?

The Thinking Through a Lesson Protocol was developed through the collaborative efforts (lead by Margaret Smith, Victoria Bill and Elizabeth Hughes) of the mathematics team at the Institute for Learning and faculty and students in the School of Education at the University of Pittsburgh.

Smith, M.S. & Bill, V. (2004, January). Thinking Through A Lesson: Collaborative Lesson Planning as a Means for Improving the Quality of Teaching. Presentation at the annual meeting of the Association of Mathematics Teacher Educators, San Diego, CA.

Hughes, E.K., & Smith, M.S. (2004, April). Thinking Through a Lesson: Lesson Planning as Evidence of and a Vehicle for Teacher Learning. Poster presented as part of a symposium, "Developing a Knowledge Base for Teaching: Learning Content and Pedagogy in a Course on Patterns and Functions " at the annual meeting of the American Educational Research Association, San Diego, CA.

The written analysis should include both parts one and two of the assignment. It is expected that both you and your partner will have nearly identical solutions for Part One since this section was completed collaboratively, but that your responses to Part Two will differ in some ways since this section was completed individually. (Note: Part One may be hand written. Part Two should be done on a computer to the extent possible.)